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NOTICE OF ENTITLEMENT

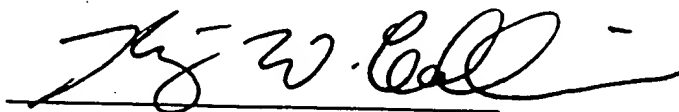
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being the applicant in respect of Australian patent application no. 16312/95 state the following:

The person nominated for the grant of the patent is a person who would, on the grant of the patent for the invention, be entitled to have the patent assigned to it.

The person nominated for the grant of the patent is the applicant of the original application.

DATED this 4th day of April 1997



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- (57) Claim

1. A method of sorting coins/tokens according to predetermined information and allowing the coins/tokens to pass to a required outlet of a plurality of outlets in accordance with the predetermined information, including the steps of:
- (a) detecting the presence of a leading edge portion of a coin/token falling into a free fall reference path above the plurality of outlets; and
- either
- (b) if the predetermined information indicates the coin-token is to be allowed to pass to a predetermined one of the plurality of outlets:
- (i) energising a solenoid to withdraw a separating means from the reference path at a location above the plurality of outlets to allow the coin/token to free-fall towards and into the predetermined outlet;
- (ii) maintaining the solenoid energised, and thus the separating means withdrawn from the reference path, for a predetermined period of time;
- (iii) resetting the predetermined time if the predetermined information indicates a following coin/token is also to be allowed to pass to the predetermined outlet; and
- (iv) de-energising the solenoid at the expiry of the predetermined period of time to allow the separating means to move into the reference path;

or

- (c) if the predetermined information indicates the coin/token is to be deflected to pass to another of the plurality of outlets:
 - (i) maintaining the separating means in the reference path at a location above the plurality of outlets to deflect a leading edge portion of the coin/token to direct the coin/token towards and into the another outlet; or
 - (ii) de-energising the solenoid to allow the separating means to move into the reference path above the plurality of outlets to deflect the leading edge portion of the coin/token to direct the coin/token towards and into the another outlet.

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**ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT**

Invention Title: COIN/TOKEN SEPARATOR

The following statement is a full description of this invention, including the best method of performing it known to us:

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COIN/TOKEN SEPARATORField of the invention

This invention relates to an apparatus and a method of separating coins and tokens.

5 Background of the invention

Generally speaking, high speed coin/token operated gaming machines, ie. poker machines or slot machines have been limited to single coin/token acceptance.

10 In each of the above applications, especially in gaming machines, the quicker the coin/token validation system can operate the greater the turnover possible from such machines. It has recently been proposed in relation to gaming machines that input hoppers may be attached to the machine to allow an operator to play the game more quickly.

15 In Application No PCT/AU91/00295 a coin validation system is disclosed which pulses an incoming coin and analyses a back EMF curve or de-energization curve to obtain a signature of the incoming coin/token. This is compared to reference information. It is possible to analyse many (7 or more) coins/second and provide a signal to an accept/reject mechanism which forms part of the coin path. If an invalid coin is
20 identified the accept/reject mechanism does not move from constituting part of the coin path. However, if a valid coin is identified the accept/reject mechanism withdraws from the coin path and that coin is passed to another passageway.

25 It will be evident that if the accept/reject mechanism used in association with the coin validation system cannot react as quickly as the validation system, there will be no overall increase in the speed with which coins/tokens can be processed.

Further, current coin validation systems aim to identify valid coins from invalid coins. In gaming machines there is a further need to process the

Stream of valid coins. For example to direct a part of the stream to different locations.

With current designs, coins are introduced into the machine through a coin validator (comparator) which, with the exception of the validator the subject of the Application No. PCT/AU91/00295, have a limited ability of only being able to recognise one particular
 5 coin denomination. These coins are directed via a diverter gate to wither the coin hopper or the cash box. If the hopper is full, a signal is given to the diverter to direct coins to the cash box. When the coins in the hopper fall to a preset level a signal is then given to the diverter to change position and direct all coins to the coin hopper.

As the complexity of the games played upon gaming machines has increased so that the
 10 maximum bet value. It is nor uncommon to have a \$10 bet on a 20¢ machine which would require the insertion of 50 coins, a tedious task. Player acceptance and cash input could both be increased if the machine were capable of accepting 20¢ coins plus higher denominations eg \$1 and \$2 coins and provide the appropriate number of 20¢ credits.

The speed of operation of the separator mechanism is therefore becoming critical if it is to
 15 separate a higher volume of coin or token throughput and/or separate multi-denominational coin token streams. Current separating mechanisms are not capable of reliably sorting a stream of multi-denominational coins into two paths at 7 coins/sec.

Description of the Invention

According to the present invention there is provided a method of sorting coins/tokens
 20 according to predetermined information and allowing the coins/tokens to pass to a required outlet of a plurality of outlets in accordance with the predetermined information, including the steps of:

- (a) detecting the presence of a leading edge portion of a coin/token falling into a free fall reference path above the plurality of outlets; and
- 25 either
 - (b) if the predetermined information indicates the coin-token is to be allowed to pass to a predetermined one of the plurality of outlets:
 - (i) energising a solenoid to withdraw a separating means from the reference path at a location above the plurality of outlets to allow the coin/token to
 30 free-fall towards and into the predetermined outlet;
 - (ii) maintaining the solenoid energised, and thus the separating means withdrawn from the reference path, for a predetermined period of time;

- (iii) resetting the predetermined time if the predetermined information indicates a following coin/token is also to be allowed to pass to the predetermined outlet; and
- (iv) de-energising the solenoid at the expiry of the predetermined period of time to allow the separating means to move into the reference path;

or

- (c) if the predetermined information indicates the coin/token is to be deflected to pass to another of the plurality of outlets:

- (i) maintaining the separating means in the reference path at a location above the plurality of outlets to deflect a leading edge portion of the coin/token to direct the coin/token towards and into the another outlet; or
- (ii) de-energising the solenoid to allow the separating means to move into the reference path above the plurality of outlets to deflect the leading edge portion of the coin/token to direct the coin/token towards and into the another outlet.

Preferably, the predetermined outlet is a continuation of the freefall reference path to anyone of the plurality of outlets.

It is preferred that the predetermined time be as least as long as the time taken for a coin/token to pass from the point of detection of step (A) until it has exited anyone of the plurality of outlets.

Furthermore, it is also preferred that a pre-set open delay time is required to have expired before step (B) (i) can commence if a previous coin/token was to be deflected in accordance with step (C) (i) (or (C)) (ii).

Advantageously, the preset open delay time is at least as long as the time taken for the leading edge portion of the previous coin/token to travel from the point of deflection into another outlet. Alternatively, the preset open delay time is less than the time taken for the smallest coin to be sorted to pass the point of deflection.

Advantageously, step (B) (I) can commence immediately the preset open time has expired. Furthermore, step (C) (ii) can commence immediately a preset closed delay time has expired. In this instance, the preset closed delay time may be the time taken for the leading edge portion of a coin to pass on the point of detection referred to in step (A) above, to the point where the leading edge portion is deflected in accordance with step (C)(i) or (ii).

Description of the Drawings

The invention is now illustrated with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of a separator according to one form of the invention

Figure 2 is cross-sectional view of a separator with an alternative diverter mechanism.

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As shown in Figure 1, the separator 10 comprises a multi part housing 11, 11A and 11B. Housing 11 and 11A combine to define a coin/token chute through which a coin/token may pass.

5 A coin/token validator 13 is shown in ghost outline to which the separator 10 is slidably engaged at A. The coin/token validator 13 has a coin/token exit sensor 14 which senses the trailing edge 15 of an exiting coin/token. This information is used in conjunction with other coin/token validator information to initiate the separating function of separator 10. The preferred coin/token validator is disclosed in patent application no. 10 PCT/AU91/00295.

Whilst the drawings show separator 10 in combination with a coin/token validator its use is not so limited. It will be clear to any person skilled in the art that the separator 10 can function in response to any predetermined information.

15 The separating mechanism 16 is mounted within housing 11B via a printed circuit board 17. This mechanism 16 includes an electromagnet 18 comprised of a solenoid coil 19, a magnet 20 and solenoid core 19A.

20 As shown in Figure 1 the separator 10 is in a deflecting position. Arm 21 has a projection 22 extending through opening 23 in housing 11A. The projection 23 has an angle plate surface which assists to achieve the desired deflection. No other openings are provided in housing 11A which restricts the potential for dirt and moisture entering and interfering with the separating mechanism 16. Housings 11A and 11B combine to provide a sealed unit for electronics.

25 Projection 22 is urged through opening 23 by a spring 24 mounted upon a base 25 of housing 11B.

A stop gate 26 provides a pivot point which by the combined operation of spring 24 on projection 22 biases the other end 27 into contact with the magnet 20. End 27 is not attached to magnet 20 and forms a floating pivot 28 about which the arm 21 and projection 22 may rotate when solenoid 18 is energised.



The chute 12 is split into two exit passageways 29 and 30 by partition 31. Partition 30 does not extend above opening 23 so that any separation of coins/tokens by the projection 22 is not interfered with.

5 In operation, a coin/token C falls from coin/token validator 13. The trailing edge 15 of coin C is sensed and a control signal is generated to either maintain exit passageway 30 blocked by projection 22 or to energise solenoid coil 19 to withdraw projection 22. In the latter case a timing mechanism (not shown) can control the period of energisation of the coin and hence the time that projection 22 with withdrawn.

10 By sensing the trailing edge 15 of coin/token C and allowing the coin to free fall the timer can be set for a standard period of energisation. No matter the size or mass of coin/token C the same time interval will be appropriate to allow the coin/token to fall a predetermined height.

15 The following is a more detailed explanation of the separating mechanism 18. The energisation of solenoid coil 19, magnet 20 and solenoid core 19A will cause north and south magnet poles of a magnetic field to be generated. Arm 21 is attracted towards solenoid core 19A thereby withdrawing projection 22 from the chute 12 against the bias of spring 24. The incoming coin will free fall uninterrupted through chute 12 and in particular through exit passageway 30 and from the separator 10.

20 Upon de-energisation, the solenoid coil 19 no longer attracts arm 21. Spring 24 operates to urge projection 22 into the chute 12 and deflect an incoming coin from its free fall path into exit passageway 29.

25 A sensing system 31 is located at the lower part of exit passageway 30. System 31 comprises a light emitting diode (D) 32, a lens 33 and receiver 34. The LED 32 and receiver 34 are mounted side by side in the body formed by housings 11A and 11B opposite the lens 33 which is located in partition 31.

The sensor system 31 operates such that light from LED 32 travels horizontally across exit passageway 30 and enters the base of lens 33. The light is reflected internally at one point on the internal surface of



lens 33. It is then reflected upon an opposed point of the internal surface of lens 33 and in turn back across the exit passageway 30 into receiver 34.

5 Any coin/token breaking either or both light beams will cause a signal to be generated. This sensor system 31 is located close to the exit from the separator 10 below separating mechanism 16 thereby ensuring that a coin/token which generates a signal has in fact left the separator 10.

10 The sensing system 31 can be used to generate signals to facilitate measurement of the quantity of coins/tokens going through exit passageway 30.

15 Accordingly if the separator 10 was incorporated into a gaming machine, exit passageway 29 feeds the cash box whilst exit passageway 30 feeds a hopper. If the hopper is full a signal is given to the separator 10 to all direct coins/tokens to the cash box. When the coins in the hopper fall to a preset level a signal may be given to the separator 10 to direct particular coins/tokens to the hopper.

20 Likewise by attaching this type of separator downstream of a coin validator which can distinguish multi denominations, it is possible to have the separator direct certain value coins/tokens to a preselected exit passage.

An alternate separator 40 is shown in Figure 2 and like components are given like numerical designations to those of Figure 1. Unless otherwise specified these components have the same function/description to that given in relation to Figure 1.

25 The basic difference between the separator of Figures 1 and 2 is the separating mechanism. Figure 2, comprises the same basic componentry, however, magnet 20 is not in contact with the end 27 of arm 25 when projection 22 projects into chute 12. However it is only marginally spaced eg. .5 ml. The end 27 of arm 25 is a floating pivot 28. When solenoid coil 19 is energised, a magnetic flux flows through magnet 20 which attracts end 27 of arm 25. Once end 27 is in contact with magnet



20, arm 25 is then rapidly pivoted towards solenoid coil 19 thereby withdrawing projection 22 against spring 24 and out of chute 12.



MPS0162/PS - 21/01/93

The claims defining the invention are as follows:

1. A method of sorting coins/tokens according to predetermined information and allowing the coins/tokens to pass to a required outlet of a plurality of outlets in accordance with the predetermined information, including the steps of:
 - 5 (a) detecting the presence of a leading edge portion of a coin/token falling into a free fall reference path above the plurality of outlets; and
 - either
 - (b) if the predetermined information indicates the coin-token is to be allowed to pass to a predetermined one of the plurality of outlets:
 - 10 (i) energising a solenoid to withdraw a separating means from the reference path at a location above the plurality of outlets to allow the coin/token to free-fall towards and into the predetermined outlet;
 - (ii) maintaining the solenoid energised, and thus the separating means withdrawn from the reference path, for a predetermined period of time;
 - 15 (iii) resetting the predetermined time if the predetermined information indicates a following coin/token is also to be allowed to pass to the predetermined outlet; and
 - (iv) de-energising the solenoid at the expiry of the predetermined period of time to allow the separating means to move into the reference path;
 - 20 or
 - (c) if the predetermined information indicates the coin/token is to be deflected to pass to another of the plurality of outlets:
 - (i) maintaining the separating means in the reference path at a location above the plurality of outlets to deflect a leading edge portion of the coin/token to direct the coin/token towards and into the another outlet; or
 - 25 (ii) de-energising the solenoid to allow the separating means to move into the reference path above the plurality of outlets to deflect the leading edge portion of the coin/token to direct the coin/token towards and into the another outlet.
- 30 2. A method as claimed in claim 1, wherein the predetermined outlet is a continuation of the free fall reference path to any one of the plurality of outlets.
3. A method as claimed in claim 1 or claim 2, wherein the predetermined time is at least as long as the time taken for a coin/token to pass from the point of detection of step (a) until it has exited any one of the plurality of outlets.

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4. A method as claimed in any one of claims 1 to 3, wherein a preset open delay time is required to have expired before step (b)(i) can commence if a previous coin/token was to be deflected in accordance with step (c)(i) or (c)(ii).
5. A method as claimed in claim 4, wherein the preset open delay time is at least as long as the time taken for the leading edge portion of the previous coin/token to travel from the point of deflection into the another outlet.
6. A method as claimed in claim 4, wherein the preset open delay time is less than the time taken for the smallest coin to be sorted to pass the point of deflection.
7. A method as claimed in any one of claims 4 to 6, wherein step (b)(i) can commence immediately the preset delay open time has expired.
8. A method as claimed in any one of claims 1 to 7, wherein step (c)(ii) can commence immediately a preset close delay time has expired.
9. A method as claimed in claim 8, wherein the preset close delay time is the time taken for the leading edge portion of a coin to pass from the point of detection referred to in step (a) above, to the point where the leading edge portion is deflected in accordance with step (c)(i) or (ii).
10. A method of sorting coins/tokens substantially as hereinbefore described with reference to the accompanying drawings.

20 Microsystem Controls Pty Ltd

by their Registered Patent Attorneys

FREEHILLS PATENT ATTORNEYS

4 March, 1997

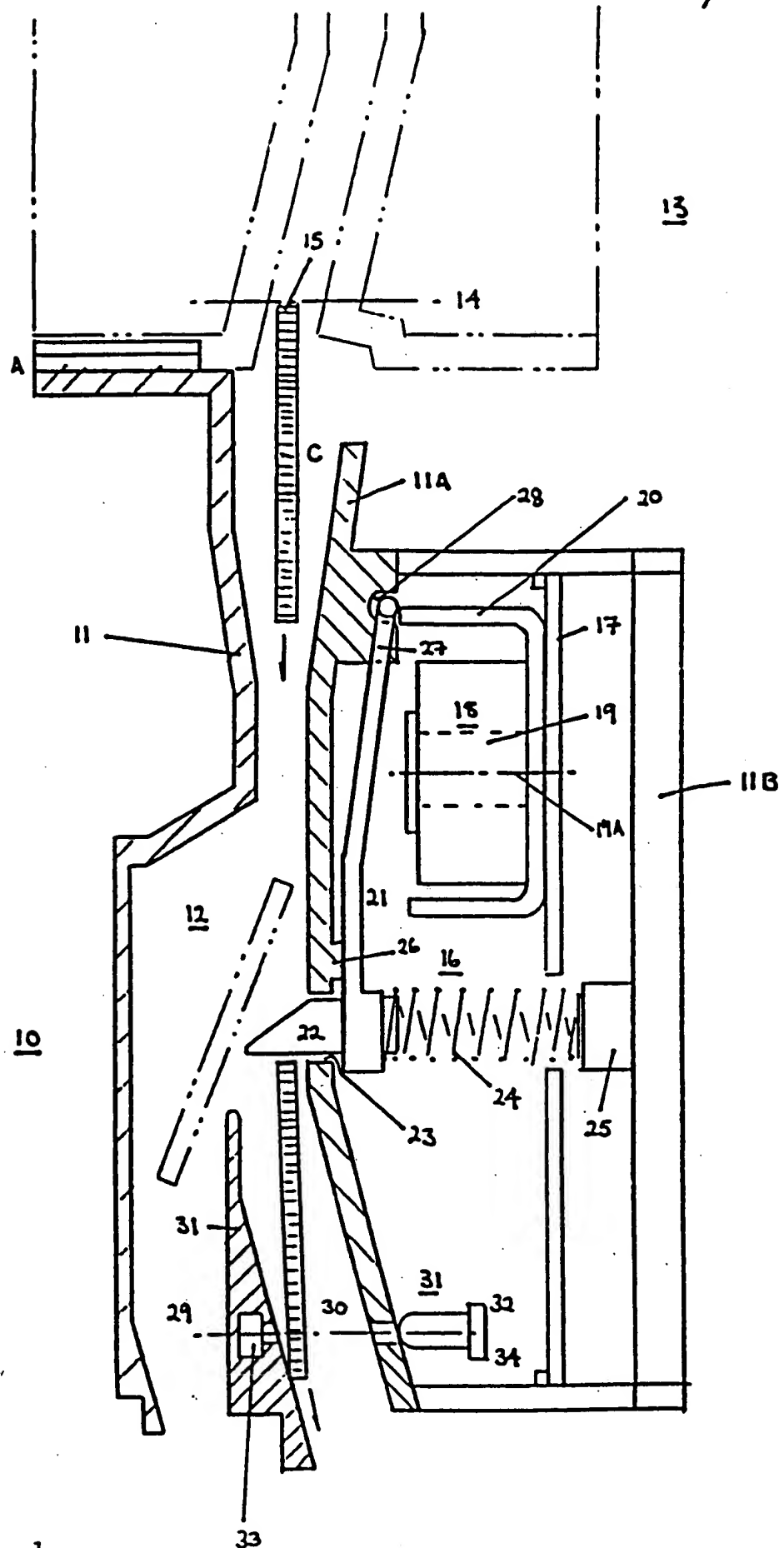


FIG. 1

